Gulf Research Reports, Vol. 5, No. 2, 43–45

SHORT COMMUNICATIONS

PENAEID SHRIMP DISTRIBUTIONS IN MOBILE BAY, ALABAMA, INCLUDING LOW-SALINITY RECORDS

HAROLD C. LOESCH*
Department of Marine Sciences, Louisiana State University, Baton Rouge, Louisiana 70803

ABSTRACT Low-salinity records in the Gulf of Mexico area for taking *Penaeus duorarum* in water of 0.7°/oo and 28°C, and *Penaeus aztecus* in water of 0.2°/oo and 29.5°C were established in Mobile Bay, Alabama. Catches in Mobile Bay of approximately 20,000 each of *P. aztecus* and *Penaeus setiferus*, distributed over a 30-month period, show that *P. aztecus* taken in the hotter months had a wider salinity preference (5 to 30°/oo) than those taken in the cooler months (10 to 15°/oo). During the warmer months *P. setiferus* was most common in waters below 5°/oo and during the winter months was almost equally distributed in the various salinities. Few *P. duorarum* were taken during the survey.

INTRODUCTION

Twelve stations in Mobile Bay, Alabama (Figure 1) were sampled monthly for 30 months by a standard 30-minute drag with a 7.7-meter lead line shrimp trawl as described in Loesch (1965). Bottom water samples were collected and titrated with silver nitrate in the laboratory for salinity calculations. Loesch (1965) did not discuss relationships between abundance of shrimp and salinity, nor did that paper establish low-salinity records for any species. The present paper is an analysis of shrimp abundance (19,413 brown, 23,161 white, and 235 pink shrimp) in 325 samples as compared to salinity (Table 1, Figure 2).

RESULTS

Gunter et al. (1974) reported that Gunter and Shell (1958) took brown shrimp, *Penaeus aztecus* Ives, at 0.8°/oo and characterized this as the lowest salinity in which they had been found on the north coast of the Gulf of Mexico. Gunter et al. (1964) reported them taken at a salinity of 0.22°/oo in Florida. Swingle (1971) reported nine brown shrimp caught in Alabama in waters where the salinity ranged from 0 to 0.2°/oo. Perret et al. (1971) reported 79 brown shrimp taken from the same salinity range in Louisiana. Christmas and Langley (1973) did not collect any brown shrimp from salinities below 0.3°/oo. On June 10, 1954, four brown shrimp were captured in Devil's Channel south of the Mobile Causeway (station 7) in 0.2°/oo salinity and 29.5°C. In the 20 collections made in water with salinities below 1°/oo, only the June 10 collection contained brown shrimp.

Hoese (1960) took pink shrimp, *Penaeus duorarum* Burkenroad, in 2.7°/oo salinity water, which Gunter et al. (1974) reported as the lowest salinity in which they had been taken in the northern Gulf. It had not previously been reported that on April 21, 1955, one pink shrimp was taken in Deer River Channel (station 5) in water of 0.7°/oo salinity and 28°C. During that month, when water was unusually

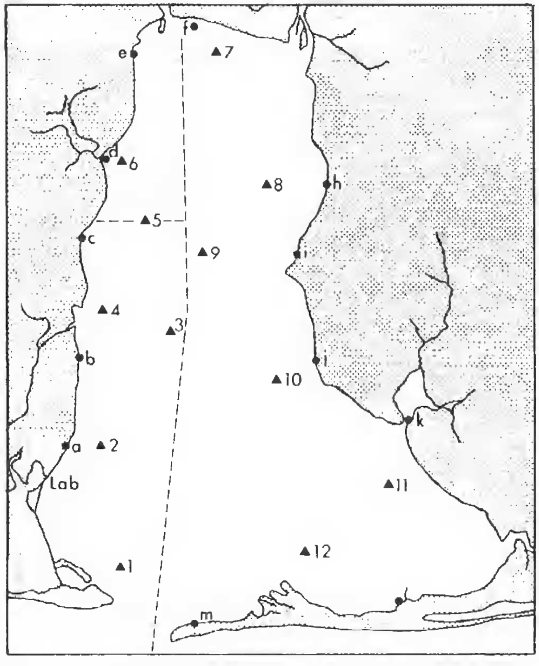

Figure 1. Bay and nearshore stations sampled in Mobile Bay, Alabama.

*Formerly principal marine biologist for the Alabama Conservation Department.

TABLE 1.

Number of shrimp, samples, and shrimp per sample caught in different salinities in Mobile Bay.

	Salinity (°/oo)							
	0–5	5–10	10–15	15–20	20–25	25–30	30+	Total
Brown, April–October, 1953–55 – Warm weather (water 21–32°C)								
Total shrimp	1055.0	4058.0	5129.0	2820.0	2434.0	2103.0	339.0	17,938.0
Total samples	46.0	38.0	40.0	40.0	30.0	15.0	4.0	213.0
Shrimp/sample	22.9	106.8	128.2	70.5	81.1	140.2	84.8	84.2
Brown, November–March, 1953–55 – Colder weather (water 8.5–21°C)								
Total shrimp	9.0	20.0	967.0	83.0	213.0	177.0	6.0	1,475.0
Total samples	28.0	19.0	16.0	17.0	18.0	13.0	1.0	112.0
Shrimp/sample	0.3	1.1	60.4	4.9	11.8	13.6	6.0	13.2
White, August–November, 1953; July–November, 1954; July–September, 1955 – Young small shrimp								
Total shrimp	5822.0	3626.0	6783.0	2188.0	1537.0	1540.0	27.0	21,523.0
Total samples	13.0	24.0	26.0	34.0	30.0	22.0	3.0	152.0
Shrimp/sample	447.8	151.1	260.9	64.4	51.2	70.0	9.0	141.6
White, July, 1953; December, 1953–June, 1954; December, 1954–June, 1955 – Somewhat older shrimp								
Total shrimp	256.0	368.0	502.0	192.0	291.0	28.0	1.0	1,638.0
Total samples	61.0	33.0	30.0	23.0	18.0	6.0	2.0	173.0
Shrimp/sample	4.2	11.2	16.7	8.3	16.2	4.7	0.5	9.5
Pink, July, 1953–September, 1955 – All pink shrimp were caught during these months								
Total shrimp	1.0	67.0	118.0	3.0	31.0	8.0	7.0	235.0
Total samples	74.0	57.0	56.0	57.0	48.0	28.0	5.0	325.0
Shrimp/sample	0.01	1.2	2.1	0.1	0.6	0.3	1.4	0.7

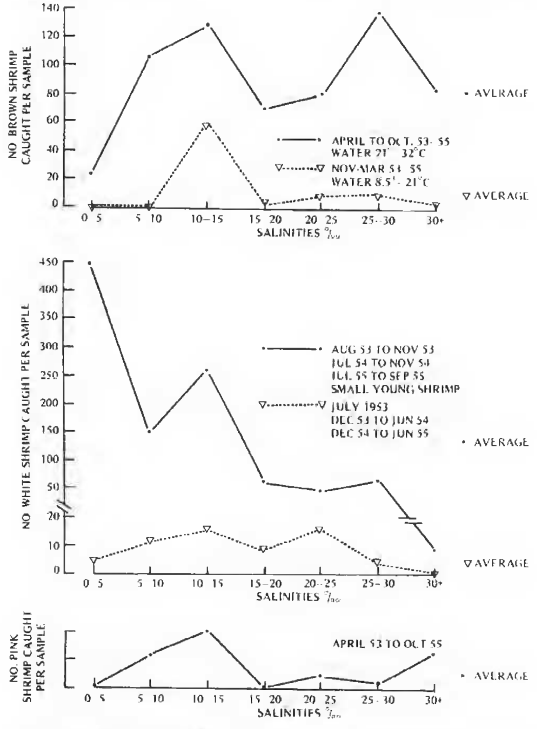

Figure 2. Average catch per sample of three species of shrimp in different salinities during two seasons of the year.

fresh, salinity was recorded at 0.5°/oo as far south as Alabama Port (station 2). Only one white shrimp, *Penaeus setiferus* (L), was taken in salinity below 1°/oo, and that was at 0.9°/oo and 29.5°C on 8 August 1955 at Devil's Channel (station 7) in the northern part of Mobile Bay.

DISCUSSION

Statistics

Loesch (1962) statistically analyzed variance of size of both brown and white shrimp and found no significant difference between years for either species. However, as would be expected, there was a highly significant difference between months/years. The bay was divided into four sections, generally from fresher water to more saline water. An analysis of variance for the four chosen locations/months/years also proved to be highly significant. In general, larger shrimp were found in the lower (generally saltier) section of the bay, and shrimp were progressively smaller towards the upper (fresher) section of Mobile Bay. For greater details on the statistical calculations and results, see Loesch (1962, p. 83–94).

Brown Shrimp

The brown shrimp catch in different salinities was calculated for two different periods of the year: from April to October, when temperature ranged from 21° to 32°C, and from November to March, when temperature ranged from 8.5° to 21°C.

During the warm months brown shrimp were common

in salinities from 5 to 30‰. There were two peaks of abundance: one at salinities of 10 to 15‰ and another at 25 to 30‰ (Figure 2). The peak at 25 to 30‰ was caused by two extremely high catches of brown shrimp in July and August 1954 at one always-rich station (station 1) located in deeper water near the mouth of Mobile Bay. In the 15 times this salinity range was sampled, half the shrimp were caught in these two samples.

During the cooler months the majority of brown shrimp taken were in salinities from 10 to 15‰.

White Shrimp

One of the two curves (Figure 2) for white shrimp started with the appearance of the new crop and lasted until most had left the area. This occurred from August to November in 1953, July to November in 1954, and July to September in 1955, when the project terminated.

During the warm months white shrimp were most plentiful in waters of low salinities, especially below 15‰ (Figure 2). During the colder months they were not plentiful at any salinity, and there appeared to be no recognizable relationship between abundance and salinity.

Pink Shrimp

All pink shrimp were caught from October to May. The majority were taken in the lower end of the bay in October and November.

LITERATURE CITED

Christmas, J. Y. & W. Langley. 1973. Estuarine invertebrates, Mississippi. In: *Cooperative Gulf of Mexico Estuarine Inventory and Study, Mississippi.* Gulf Coast Research Laboratory, Ocean Springs, Mississippi. 435 pp.

Gunter, G., B. S. Ballard & A. Venkataramiah. 1974. A review of salinity problems of organisms in United States coastal areas subject to the effects of engineering works. *Gulf Res. Rep.* 4(3): 380–475.

———, J. Y. Christmas & R. Killebrew. 1964. Some relations of salinity to population distributions of motile estuarine organisms, with special reference to penaeid shrimp. *Ecology* 45:181–185.

——— & W. E. Shell. 1958. A study of an estuarine area with water-level control in the Louisiana marsh. *Proc. La. Acad. Sci.* 21:5–34.

Hoese, H. D. 1960. Biotic changes in a bay associated with the end of a drought. *Limnol. and Oceanog.* 5:326–336.

Loesch, H. C. 1962. Ecological observations on penaeid shrimp in Mobile Bay, Alabama. Ph.D. Dissertation, Texas A&M Univ. 120 pp.

———. 1965. Distribution and growth of penaeid shrimp in Mobile Bay, Alabama. *Institute of Mar. Sci.*, Univ. Texas 10: 40–58.

Perret, W. S., W. R. Latapie, J. F. Pollard, W. R. Mock, G. B. Adkins, W. J. Gaidry & C. J. White. 1971. Fishes and invertebrates collected in trawl and seine samples in Louisiana estuaries. In: *Cooperative Gulf of Mexico Estuarine Inventory and Study, Louisiana.* La. Wildlife and Fisheries Commission. 175 pp.

Swingle, H. A. 1971. Biology of Alabama estuarine areas. In: *Cooperative Gulf of Mexico Estuarine Inventory.* Alabama Mar. Res. Bull. No. 5. 123 pp.